



Name:

Date:

1

Northwest Passage: Then and Now - Student Handout

Driving Questions:

- Why is the Northwest Passage important?
- How and why has access changed in the recent past?

Activity 1: Moving Goods in the Northern Hemisphere

Use the space below to document your findings from the Wikipedia page for the [Northwest Passage](#) about your Northwest expedition.



Activity 2 Contemporary Northwest Passages

Activity 2.1

Start Google Earth Pro and choose the Google Earth Ruler tool. Select the Path tab.

1. How long is the shortest route by ship, in kilometers, between Germany and Japan that does not go through the Arctic Ocean? Hint: this route passes through the [Suez Canal](#).
2. How long is the shortest route by ship, in kilometers, between northern Alaska and New York City that does not go through the Arctic Ocean? Hint: this route passes through the [Panama Canal](#).

Activity 2.2

Examine the [Arctic Sea Ice News and Analysis](#) page of the National Snow and Ice Data Center (NSDIC).

3. What seasonal and long-term trends in Arctic sea ice extent are of note in this report?
4. In what month is Arctic sea ice extent typically at its minimum? Explain why this occurs in terms of seasonal cycles.
5. What was the average Arctic sea ice extent (in millions of square kilometers) in mid-September from 1979 to 2000?
6. What was the Arctic sea ice extent (in millions of square kilometers) in the middle of this past September?



Activity 2.3

Go to [NSIDC Data on Google Earth](#) and open Sea Ice Minimum and Maximum Extents, 1979 to 2019 in Google Earth Pro.

7. Choose the September radio button in the Places pane for the interval of years that is indicated. Gradually drag the time slider at the top of the 3D Viewer from left to right. The display may flicker as each image loads, so give this time to occur. What is the trend in sea ice extent for September? For what year do you notice the greatest change in ice extent from the previous year?

Activity 2.4

Read the following news article from 2008: [Arctic becomes an island as ice melts](#).

8. What historic event in the Arctic has been revealed by satellite images?
9. Taking this into account, how long is the shortest route by ship, in kilometers, between Germany and Japan?
10. Taking the same event into account again, how long is the shortest route by ship, in kilometers, between northern Alaska and New York City?

Activity 2.5

Read the following article from 2004: [A Chilling Possibility](#).

11. How could melting of Arctic sea ice lead to climate change in eastern North America and Western Europe?



Activity 2.6

Read the following article from 2008: [Why Is Arctic Sea Ice Melting Faster Than Predicted?](#)
[NOAA Probing Arctic Pollution](#).

12. What factors may be causing the Arctic sea ice to melt so quickly?
13. What are some positive effects of the changes in Arctic sea ice?
14. What are some negative effects of the changes in Arctic sea ice?

Activity 2.7

Locate a recent (past 3 years) article on the state of Arctic sea ice and report on your findings here.

- Title of Article:
- Date of Publication:
- Claim and evidence presented in the article:

Formative Assessment Feedback:

Provide written feedback on their questions to help guide their understanding and help the teacher assess the level of understanding of individual students and the class as a whole.



Activity 3 Arctic Sea Ice Today - Causes and Effects

Class discussion.

Activity 4 Transporting Oil Today

Activity 4

Now that we have an understanding of how the Northwest Passage has changed over time, you are being tasked with solving the following problem:

You are an engineer working for a company that currently extracts oil from the North Slope Oil Fields in Alaska. Your company is realizing that with the changing conditions of the sea ice in the Northwest Passage that it may be economical to transport oil via ship rather than to continue using the Alaska Pipeline, which is expensive to maintain as it ages.

Your assignment is to determine whether it is viable to use the Northwest Passage as a transport route. For full credit, you will include your findings in the following areas:

- Based on data from your investigation, during what months will it be possible to use the passage?
- Describe in detail (with diagrams) what would be necessary to explore possible routes in terms of people and equipment.
- Describe how your company would mitigate the potential environmental threat of an oil spill like the one that occurred in the Gulf of Mexico in 2010 or with the Exxon Valdez in Prince William Sound, Alaska in 1989.
- Summarize the shortest and most economical routes for your company. Also, outline alternative routes for your shipping in the event that your shortest route is blocked by ice.
- What do you predict will be the long-term outlook for using the passage as a practical (ice-free) passage to transport oil for your company?



Prepare a short (three detailed paragraphs) summary of your findings that explains to the company leadership whether you recommend using the Northwest Passage as a transport route. Back your findings with scientific evidence found during your investigations in this lesson.

Report your findings using presentation software (ex: Microsoft Powerpoint or Google Slides) to be shared at a stakeholders meeting. Be sure to include maps and graphics to support your solutions.

You will be presenting your findings to the class, where we will identify the best solutions. Use the rubric below to guide your progress in this assignment.

Activity 4 Assessment Rubric:

Category	4	3	2	1
Use of Class Time	Used time well during each class period. Focused on getting the project done. Never distracted others.	Used time well during each class period. Usually focused on getting the project done and never distracted others.	Used some of the time well during each class period. There was some focus on getting the project done but occasionally distracted others.	Did not use class time to focus on the project OR often distracted others.
Content Accuracy	Information is thorough and covers all relevant facts relating to the topic.	Information is accurate and facts are displayed on the poster. Most relevant facts are covered with few areas left unresearched.	Information is generally accurate with some questionable facts. Gaps are left in several areas related to the topic.	Facts are questionable about accuracy. Gaps are left in many areas related to the topic.

Knowledge Gained	Student can accurately answer all questions related to facts in the presentation and processes used to create the poster. He/She has made strong connections and included numerous thoughtful explanations.	Student can accurately answer most questions related to facts in the presentation and processes used to create the presentation. He/She has made some connections and included several thoughtful explanations.	Student can accurately answer about 75% of questions related to facts in the presentation and processes used to create the presentation. He/She has made connections and/or included some explanations.	Student appears to have insufficient knowledge about the facts or processes used in the presentation. He/She did not make sufficient connections or include needed explanations.
Mechanics	Capitalization and punctuation are correct throughout the presentation.	There are only a few errors in capitalization or punctuation.	There are several errors in capitalization or punctuation.	Errors in capitalization or punctuation are numerous.
Grammar	There are no grammatical mistakes in the presentation.	Grammatical mistakes in the presentation are minimal.	There are several grammatical mistakes in the presentation.	There are numerous grammatical mistakes in the presentation.

Graphics - Originality	Several of the graphics used in the presentation reflect an exceptional degree of student creativity in their creation and/or display.	One or two of the graphics used in the presentation reflect student creativity in their creation and/or display.	The graphics are made by the student, but are based on the designs or ideas of others.	No graphics made by the student are included.
Graphics - Clarity	Graphics are all in focus and the content easily viewed and identified from 8 ft. away.	Most graphics are in focus and the content easily viewed and identified from 8 ft. away.	Most graphics are in focus and the content is easily viewed from close proximity.	Many graphics are not clear or are too small.
Graphics - Relevance	All graphics are related to the topic and make it easier to understand. All borrowed graphics have a source citation.	All graphics are related to the topic and most make it easier to understand. All borrowed graphics have a source citation.	All graphics relate to the topic. Most borrowed graphics have a source citation.	Graphics do not relate to the topic OR several borrowed graphics do not have a source citation.